Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

II. *Observations on the Hirudo vulgaris.* *By* James Rawlins Johnson, *M. D. F. L. S. &c.* *Communicated by the Right Hon. Sir* Joseph Banks, *Bart. G. C. B. P. R. S.*

Read Nov. 14, 1816.

STRONGLY impressed with the conviction that every attempt to elucidate any part of natural history, will meet with a favorable reception, I have ventured to submit to the notice of the Royal Society, a few observations relative to the mode of propagation, &c. of the *Hirudo vulgaris.*

This little animal (Pl. IV. Fig. 1, 2.) is found in great abundance in rivulets, attached to the under surface of stones, and in those situations where it is little exposed to the action of the current. It varies as to its length, from an inch to an inch and a half, is of a dark brown colour on the back, marked with numerous transverse lines, but of nearly one uniform colour on the belly, chiefly that of a yellowish green. A central line of a black colour passes both on the back and belly, from the head to the tail. The ground colour, however, differs, hence several varieties have been enumerated.

From the circumstance of its having eight eyes, which are delineated, magnified, in Fig. 4, it has been denominated by LINNÆUS and others, *Hirudo octoculata;* but the *Hirudo tessulata* presenting an equal number of eyes, we shall give the preference to the name under which we find it described in MULLER, that of *Hirudo vulgaris.*

It appears, from the statement of an eminent naturalist, lately deceased, that this animal possesses the power of

reproduction in almost an equal degree with the polype: but the experiments I have hitherto made, by no means establish this point.

In its structure the *H. vulgaris* closely resembles the *H. medicinalis*. At the extremity of the tail we find the *anus*. There are four vessels destined to convey the circulating fluid; a dorsal, an abdominal, and lateral vessels. These tubes carry red blood, and have a well marked systole and diastole. Eight pulsations occur in the course of a minute. I have frequently placed the *H. vulgaris* under the microscope, in order to discover a central organ of the vascular system, or what corresponds to the heart, but without effect. According to the opinion of some physiologists, the several dilatations occurring in the course of the abdominal blood vessel, which, in the present instance, assume the figure of a diamond, (a portion of which is seen, magnified, in Fig. 5.) answer very effectually this purpose.

The food of the *H. vulgaris* consists of the smaller kind of earth-worms, &c. which, in like manner with the *H. sanguisuga*, it swallows whole.

In the summer of 1815, I kept several of these animals, in order to discover their mode of propagation. Examining the vessels that contained them, from time to time, I found them to be oviparous: the ova being enveloped in a gelatinous mass, surrounded by a firm membrane, to which we attach the term of capsule. These ova I preserved many months, but they proved unproductive. Disappointed in this my first attempt, I resolved to continue my research, and again collected during the last summer, a considerable number; when the object I had in view, was fully attained.

About the middle of June, several capsules were deposited. As some of them were transparent, I had an opportunity of examining their contents. I could distinctly observe the ova in them; then had the satisfaction of identifying animal existence; and ultimately, of tracing the young from this period to their exclusion.

Having thus found the ova productive, I examined the vessel daily, with a view of marking the time when they were deposited, and the period required to produce the changes I have noticed.

On the 4th of August, I observed a capsule, in which the ova were very distinct: on the 26th of the same month, animal existence was developed, and on the 17th of September the young were excluded. In this instance, signs of vitality were manifest in twenty-two days, and in forty-four days, the young had escaped.

On the 14th of August, another capsule was deposited, in which animal existence was evident on the 1st of September, and on the 24th of the same month, the young were excluded. In this case, the first sign of life was traced in eighteen days, and the young had escaped in forty-two days.

August 13th. I observed two of the *H. vulgaris* in *actu coitus*, and found them to copulate after the same manner as the common snail. In this state I removed and kept them apart from the rest. On the following morning they had separated, when I consigned them to different vessels. One of them, shortly afterwards, escaped from its confinement, and was lost. It, however, produced two capsules, one on the 17th of August, the fourth day after copulation, and the other on the 18th; both which proved unproductive. The

other leech produced a capsule on the 17th of August, the fourth day also after copulation, and one on each of the following days: 18th, 21st, 23d, 24th, 27th, 30th, September 4th and 8th: on the 2d of October, it died. In the whole it deposited nine capsules: of these, two only were productive. The one, (17th August) indicated animal existence in twenty days (6th September), and in fifty-six days (12th October), the young were excluded. In the other (August 18th), animal existence was developed in twenty-one days, (September 8th), and in sixty days (17th October), the young made their escape. Thus, traces of vitality were manifest in each of the capsules about the same time as in those previously mentioned; that is, in three weeks: but, from this period to the exclusion of the young, five weeks had in the latter instance elapsed, whereas, in the former, this occurrence took place in the space of three weeks. This I can only account for, by stating, that the ova deposited on the 4th and 14th of August were exposed to the sun, whilst those produced on the 17th and 18th of the same month, were kept constantly in the shade.

We shall now describe the manner in which these capsules are deposited.

When the *H. vulgaris* is about to produce one of these bodies, it is observed to be greatly contracted both above and below the uterus. After having fixed its tail, which it does not once remove during the operation, it in the course of ten minutes presents the appearance represented in Fig. 3. At first, there is no difference as to colour between the distended portion and the rest of the body; but, in a few minutes, this part becomes of a milky-white colour, from the formation

of a film or membrane, into which the animal forces, with some effort, the whole contents of the uterus. This done, the *H. vulgaris* elongates the anterior portion of the body, and thus loosening the enveloping membrane, withdraws its head from it, as from a collar. In some instances, where this membrane cannot be readily detached, I have observed the animal to bend back its head, and then taking it in its mouth, and drawing it gently, is thus enabled to remove it. From the first formation of this membrane or capsule, to its removal from the body, twenty minutes usually elapse. It is, at this time, very elastic, and of no determinate figure. After the *H. vulgaris* has firmly fixed it to some surrounding substance, it fashions it with its mouth, until it presents an oval form, such as is delineated in Fig. 7. It afterwards returns once or twice to survey it, when all farther notice of it ceases.

The accuracy of this statement may perhaps be questioned. It may be considered as highly improbable, that the capsule should be deposited after this manner. Strange, however, as it may appear, I have several times witnessed the leech drawing the anterior part of its body through it, as through a ring. Indeed, I know of no other way in which it can possibly get rid of it, *the membrane forming a complete band round its body.* Although this mode may be somewhat singular, yet there is little in it to excite our surprise, in comparison with what we find recorded in the works of naturalists.

When deposited in an unattached state, that is, left free, and floating in the water, the capsules are mostly of a globular form (as in Fig. 6). When fixed to any substance, they present an oval form (as in Fig. 7), which is by far the most

common. They are at first of a greyish white colour, *a a*, but in ten or fifteen minutes become of an amber colour, *b b*. They differ much as to size, but are usually about three lines in length, and two in breadth, convex above and flattened beneath. The dark points (Fig. 8, *a a*) mark the openings left in the capsule by the manner in which the leech deposits it, and are those places from which (the resistance there being less than in any other part) the young escape. They are deposited during the whole of the summer months, and even so late as the month of October (29th), and contain each from six to twelve ova; which are well defined as to figure, being perfectly round, and have a smooth uniform appearance. The ova, and the enveloping membrane are represented, magnified, in Fig. 8. In about a fortnight the ova are much increased in size, and show rough edges (Fig. 9.) In three weeks, they take the form of an oblong oval (Fig. 10), when animal existence is, for the first time, developed: which consists, in simply an elongation and contraction of the body. At this period, there is little or no resemblance to the parent animal. In six weeks, the young are completely formed, and in active motion about to quit the capsule. Fig. 11 shows the included young at this period.

It is not a little amusing to witness their exertions to escape from their imprisonment. They contract themselves, as it respects their length, into as small a compass as possible, and then forcibly push forward the head, butting, as it were, at the dark point of the capsule to effect their escape. After many efforts, they succeed in making a small opening, through which they endeavour to force a passage. I have frequently watched them, the head having free motion

without the capsule, using their utmost exertions to free themselves, but not being able to accomplish this, they have returned to their former situation, renewing their efforts occasionally, until their object was attained.

At the time of birth, they are nearly colourless, and continue so for many months, with very little increase as to size. They have the property of moving on the surface of the water, with their belly uppermost. I have noticed nothing of this nature in these animals, when fully grown. According to MULLER, this faculty is possessed by the *Hirudo hippoglossi:* he says, " Præter hunc incessum (more geometrarum) alium in hac specie observavi, inversum nempe, dum corpore supino, summum aquæ ore et cauda, alternatim prehendit." Hist. Verm. ii. p. 51. I have observed it to be also common to the *Hirudo stagnalis* and the *Hirudo complanata.* These animals, differing in several particulars from the leech, are now formed into a distinct genus; to which, from their possessing a retractile tubular tongue, we have given the name of GLOSSIPHONIA.

Considering the quantity of the *H. vulgaris* that I preserved, during the summer, I was surprised at the comparatively small number of capsules deposited. This was at length accounted for. Whilst watching one of them, during the formation of this membrane, I observed another move forward towards the same place, seize it in its mouth, and tear it into three or four shreds, which it left floating in the water.

I now placed the *H. vulgaris*, singly, in different vessels, and found I could by this mode increase the number of the capsules. Each leech produced, in less than a month, from

six to twelve. One of them deposited, from the 8th of October to the 29th of the same month, no less than twelve capsules, and taking an average number of the ova they contain, and supposing only one-third to be productive, we should have thirty-six young from this single leech.

From the similarity of the *Hirudo vulgaris*, both in its structure and general appearance, to the *Hirudo medicinalis*, I think, we have every reason for believing that the latter is also oviparous; and that the ova have an enveloping membrane, which is formed and deposited, after the manner already mentioned.

From what has been advanced, we learn,

1. That the *Hirudo vulgaris* copulates in the same manner as the common snail.

2. That it is oviparous.

3. That the ova are imbedded in a gelatinous mass enveloped by a strong semi-transparent fibrous membrane, denominated the capsule.

4. That the capsule contains from six to twelve ova, which are globular, and have a smooth surface.

5. That these ova in the course of a fortnight, lose their globular shape, and show jagged edges: that in three weeks, they take the form of an oblong oval, when we discover animal existence: and in six weeks, the young make their escape.

6. That the number of the capsules each leech produces, (one every second or third day) varies from six to twelve.

7. That the young are nearly colourless at the time of birth, and continue so for many months, increasing little as to size.

Fig. 1.

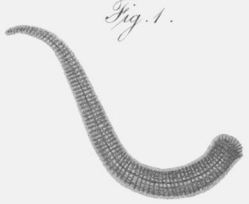

Fig. 2.

Fig. 6.

Fig. 7.

Fig. 3.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 4.

Fig. 11.

Fig. 5.

EXPLANATION OF THE DRAWING.

Fig. 1. A front view of the *Hirudo vulgaris*, of its natural size.

Fig. 2. A back view of the same.

Fig. 3. The appearance it presents previous to its depositing the capsule.

Fig. 4. The eyes (magnified) showing their arrangement.

Fig. 5. A portion of the abdominal blood-vessel, magnified, showing its diamond-figured dilatations.

Fig. 6. The globular form of the capsule, when unattached, (of its natural size).—*a*, its appearance at the moment of deposition: *b*, the appearance it afterwards assumes.

Fig. 7. The form of this membrane (also of its natural size) when attached to any surrounding body.

Fig. 8. The capsule, magnified, showing the included ova, (*a a*) the points from which the young escape.

Fig. 9. The appearance of the ova at the end of a fortnight.

Fig. 10. The ova at the expiration of the third week, when animal existence is first observed.

Fig. 11. The appearance of the young at the termination of the sixth week, when they are about to quit the capsule.

JAMES RAWLINS JOHNSON.

Bristol, October 30, 1816.